



CASE REPORT

Osteocutaneous radial forearm free flap in subtotal nasal reconstruction

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SUMMARY

A 66-year-old man presented with a large squamous cell carcinoma of the right nasal vestibule. He underwent partial rhinectomy and medial maxillectomy followed by staged reconstruction. Reconstruction of a full-thickness nasal defect requires repair of three distinct layers: the skin–soft tissue envelope, subsurface framework and intranasal lining. We report the first use in the UK of an osteocutaneous radial forearm free flap in the reconstruction of a subtotal nasal deficit. The skin of the radial forearm free flap was tubed to recreate the nasal lining and the radial bone reconstructed the dorsal contour of the nose. A full-thickness paramedian forehead flap supplied external coverage. The osteocutaneous radial forearm free flap and forehead flap is a viable option for large nasal defects requiring reconstruction of framework, nasal lining and external covering.

outcome and remarkable acceptance in many cases.¹ Some patients, however, have problems with nasal air flow or psychological problems with a removable prosthesis.²

Reconstruction of full-thickness nasal defects requires a complex and individualised approach. Replacement of the intranasal lining is the most challenging and underappreciated aspect of reconstruction.³ The gold standard for replacement of the lining is nasal septal/vestibular local flaps; however, with a large defect, alternative tissue must be sought.⁴ The nasal bones, upper lateral cartilages, septum and fibrofatty alae shape the nose. If these are excised, a supportive middle layer must be replaced to contour the cover and brace the reconstruction against oedema and scar contraction.^{5 6}

BACKGROUND

There are two methods for covering extended nasal resection defects: prosthesis or reconstruction. Prostheses commonly result in a good aesthetic

CASE PRESENTATION

A 66-year-old man presenting with a large squamous cell carcinoma of the right nasal vestibule (figure 1) underwent oncological resection via partial rhinectomy and medial maxillectomy

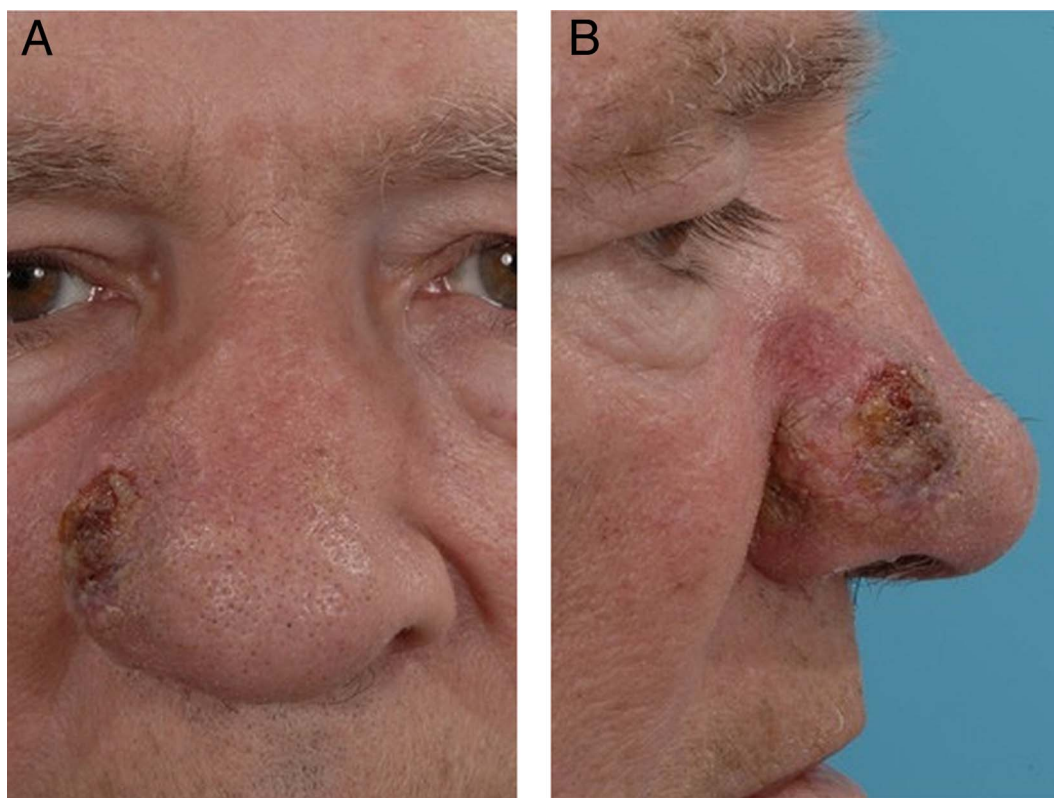


Figure 1 Preoperative anteroposterior (A) and lateral (B) photographs of an exophytic squamous cell carcinoma erupting from the right nasal vestibule.



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Figure 2 Intraoperative photograph of the defect resulting from partial rhinectomy and medial maxillectomy.

(figure 2) followed by staged reconstruction. The first stage of reconstruction immediately followed resection: a composite radial forearm free flap with a 9 cm×6 cm skin paddle and cortical bone (15% of the circumference of the radius). A right cheek advancement was also performed. The skin paddle of the flap was tubed and inserted into the nasal cavity, splinted with a nasopharyngeal airway, to recreate the nasal lining. The bone of

the graft was screwed to existing nasal bones and the flap was anastomosed with the facial vessels. The external surface was covered with a split skin graft (figure 3).

Three weeks later the skin graft was removed, the radial forearm flap was thinned and a paramedian forehead flap was inset with a nasopharyngeal airway in the right neovestibule to assist nasal patency (figure 4). At the third stage the forehead flap was debulked. Further nasal contouring was performed with a cartilaginous shield graft, a columellar strut graft and an upper lateral nasal cartilage graft was fashioned from rib and conchal cartilage. At a later stage the forehead pedicle was divided and an alar graft inserted into a pocket in the alar rim, splinted with a nasopharyngeal airway. Figure 5 shows the final appearance.

DISCUSSION

The reconstruction of large nasal defects must take into account the missing deep tissue volume, lining, framework and restoration of adjacent facial units to achieve a functional and aesthetic result.⁷ A covering of correct proportion, colour and subcutaneous tissue quality is necessary to give a natural appearance to the nasal surface. We have used microvascular lining with integrated bone, cartilage support grafts and a covering forehead flap for subtotal nasal reconstruction. The microvascular transfer was directed to the restoration of the nasal lining and bony framework for creation of a patent nasal airway. The contour of the nose evolved from the foundation provided by the microsurgically rendered base onto which the construction of a cartilaginous framework and the overlay of a covering forehead flap were applied.

A shortage of good nasal lining often compromises reconstruction as scar contraction will distort the unlined nose. The replacement lining must be flexible and thin so as not to obstruct the airway or alter the external shape, but be well vascularised to support cartilage grafts.⁸ The principle of replacing

Figure 3 (A) Intraoperative photograph of the tubed radial forearm free flap used to recreate the right nostril and radius screwed to the pre-existing nasal bones. (B) A nasopharyngeal airway has been used to assist with nasal patency and the flap has been covered with split skin to allow wound healing between reconstructive stages.

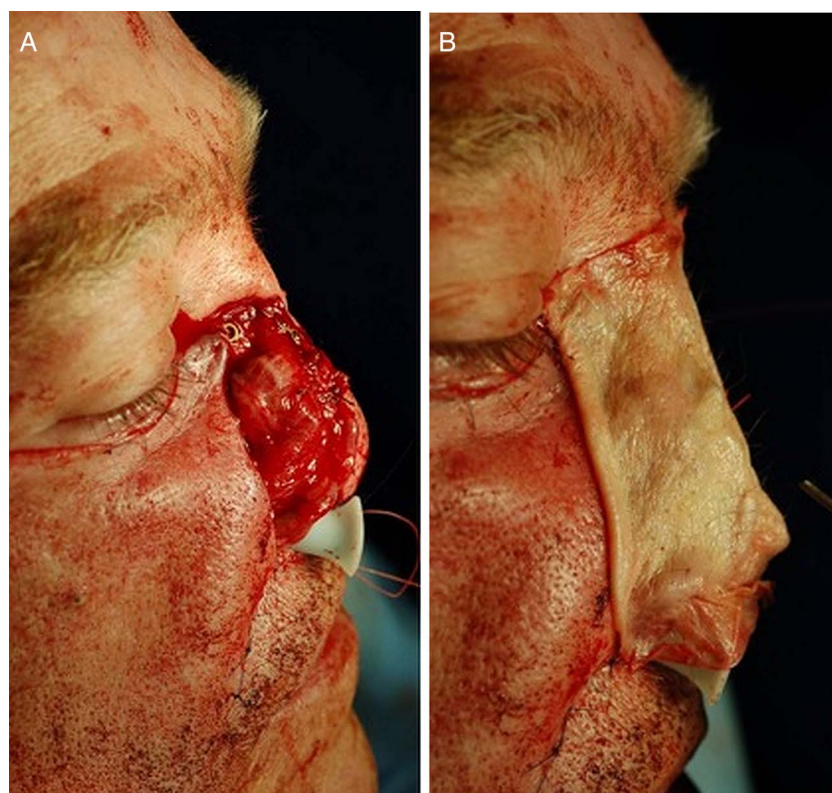




Figure 4 Photograph of the early postoperative appearance with rib graft, conchal cartilage graft and paramedian forehead flap in situ.

the nasal lining is to replace like with like, using local septal or vestibular flaps.³ When faced with large subtotal rhinectomy defects, however, these are insufficient.⁹ The radial forearm free flap provides thin vascular tissue suitable for reconstruction of the nasal lining that is easily harvested with acceptable donor site deformity.⁴ The free radial forearm flap will not markedly contract intranasally, allowing the airway to be revised and maintained. Skin grafts cannot sustain primary cartilage grafts or cover exposed cartilage/bone and contracture often leads to stenosis and difficulty with respiration.^{10 11}

Bone and cartilage grafts re-establish the nasal framework. The hard tissue subsurface framework placed early in reconstruction, before pedicle division, acts to resist scar contraction, supports the lining to maintain a patent airway and shows through a conforming skin envelope, re-establishing the nasal

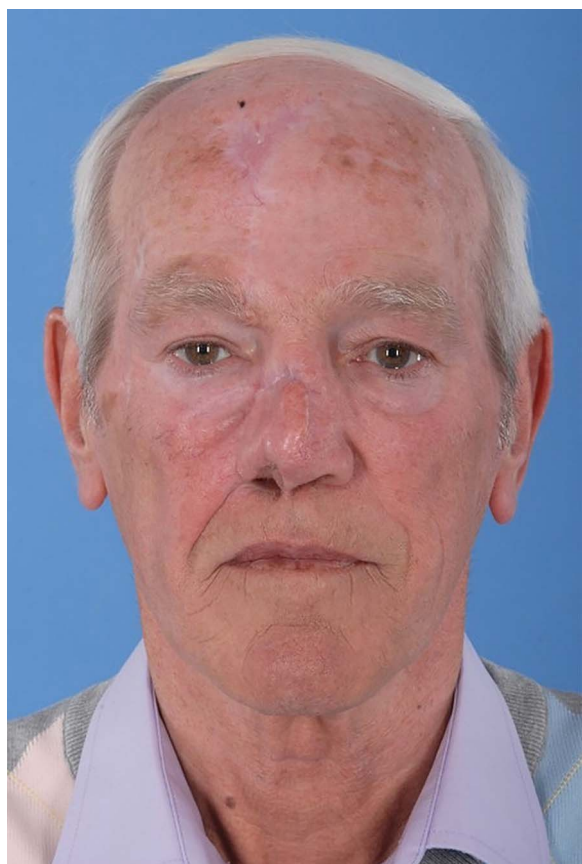


Figure 5 Appearance at 12 months.

contour.⁵ In addition to central support, tip and lateral alar structural grafts are often necessary to tent the nasal airway open during inspiration.⁴

Skin grafts, melolabial flaps, forehead flaps and free flaps have been described in the reconstruction of the external nasal covering.¹⁰ For aesthetic results the covering must be thin, to allow the contour of support grafts to show through externally, and vascular in order to sustain them. The paramedian forehead flap is frequently the optimum for reconstruction of large nasal deficits as its colour and texture are similar to those of nasal tissues.

In a case series of reconstruction of the nasal vestibule and columella lining by Burget and Walton in 2007, multipaddled fascial radial forearm free flaps were used in combination with forehead flaps for coverage. It was shown that the use of free nasal lining flaps allowed the creation of a functional airway and permitted the application of a cartilage framework and covering flap to be sculpted to an aesthetic result.⁷ Stable long-term results in three-layer subtotal nasal reconstruction have been reported with an osteocutaneous flap from the medial distal femoral condyle. The skin paddle of the graft was folded into a double canal to reconstruct the nasal lining and the bone of the graft was osteotomised to reconstruct the nasal skeleton.¹² In a case reported by Winslow *et al*,¹⁰ split calvarium and conchal cartilage were used to reconstruct the nasal skeleton with a free fascial forearm flap lined with turbinate epithelium for reconstruction of the nasal lining and a paramedian forehead flap to resurface with a good functional outcome.

Reconstruction of the nasal lining in subtotal rhinectomy defects is not a straightforward procedure and no method has been standardised. This case demonstrates one possible method of microvascular nasal lining in providing for a functional nasal airway, a base for the application of subsurface framework and can also provide composite radius for bony support. This flap has consistent anatomy, is easy to harvest, has a long vascular pedicle and possesses the necessary pliability and thinness to be easily folded without creating excessive bulk; it is ideal for reconstruction of the nasal lining. When combined with the paramedian forehead flap it can result in a good functional and aesthetic outcome for reconstruction of subtotal nasal defects.

Learning points

- Reconstruction of full-thickness nasal defects requires repair of three distinct layers: the skin–soft tissue envelope, the subsurface framework and the intranasal lining. Replacement of the intranasal lining has often been the most challenging of the three layers.
- Cases in the USA have demonstrated fascial radial forearm free flaps to be efficacious in restoration of missing elements of the nasal lining combined with a forehead flap and secondary subcutaneous contouring with cartilage grafts.
- This case describes the first use of an osteocutaneous radial forearm free flap for reconstruction of the nasal lining and bony framework and the first UK experience of a radial forearm free flap in nasal lining restoration.

Contributors All the authors contributed to the conception and design of the study and drafting, revision and final approval of the submitted version.

Competing interests None.

Patient consent Obtained.

Provenance and peer review Not commissioned; externally peer reviewed.

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